1   1.   In a database including primary and secondary servers and a data

2   replicator that copies database log entries from the primary server to the secondary server

3   and updates the secondary server using the copied database log entries, an indexing

4   method including:

5   creating on the primary server a user-defined index of contents of the database,

6   the user-defined index including at least user-defined routines and the creating including

7   at least some operations that do not produce database log entries;

8   obtaining on the primary server a lock on the user-defined index;

9   constructing on the primary server a definitional data set containing information

10   on the user-defined routines;

11   transferring the definitional data set from the primary server to the secondary

12   server;

13   constructing on the secondary server secondary user-defined routines based on the

14   definitional data set;

15   transferring contents of the user-defined index from the primary server to the

16   secondary server as transferred contents, the transferred contents in combination with the

17   secondary user-defined routines defining a secondary user-defined index corresponding

18   to the user-defined index created on the primary server; and

19   removing the lock on the user-defined index.

1   2.   The indexing method as set forth in claim 1, further including:

2 transmitting an acknowledgment from the secondary server to the primary server

3 indicating that the secondary user-defined index is defined, the removing of the lock

4 being performed in response to the primary server receiving said acknowledgment.

1 3. The indexing method as set forth in claim 1, further including:

2 registering the user-defined index with the secondary server.

1 4. The indexing method as set forth in claim 1, wherein the creating a

2 user-defined index includes creating an R-tree index.

1 5. The indexing method as set forth in claim 1, further including:

2 responsive to a failure of the data replicator and a subsequent restart of the data

3 replicator, repeating the obtaining of a lock, the constructing and transferring of a

4 definitional data set, the constructing of secondary user-defined routines, the transferring

5 of contents of the user-defined index from the primary server to the secondary server, and

6 the removing of the lock.

1 6. The indexing method as set forth in claim 1, further including:

2 subsequent to the removing of the lock, performing database operations that

3 access the user-defined index on the primary server, database log entries corresponding to

4 the database operations being copied by the data replicator from the primary server to the

5 secondary server and the secondary server being updated using the copied database log

6 entries and the secondary user-defined index.

1   7.   The indexing method as set forth in claim **1**, further including:

2   initiating the data replicator subsequent to the creating of the user-defined index

3   of contents of the database on the primary server, the obtaining of a lock, the constructing

4   and transferring of a definitional data set, the constructing of secondary user-defined

5   routines, the transferring of contents of the user-defined index from the primary server to

6   the secondary server, and the removing of the lock being performed subsequent to the

7   initiating of the data replicator.

1   **8.**   The indexing method as set forth in claim **1**, further including:

2   initiating the data replicator, the initiating being performed prior to the creating of

3   the user-defined index, the obtaining of a lock, the constructing and transferring of a

4   definitional data set, the constructing of secondary user-defined routines, the transferring

5   of contents of the user-defined index from the primary server to the secondary server, and

6   the removing of the lock.

1   **9.**   A database backup system for monitoring a database deployed on a

2   primary server and for maintaining a copy of said database on a secondary server, the

3   database backup system including:

4   a data replicator in operative communication with the primary and secondary

5   servers to copy database log entries from the primary server to the secondary server and

6   to update the secondary server using the copied database log entries; and

7   a user-defined routines replicator in operative communication with the primary

8   and secondary servers to copy user-defined routines deployed on the primary server to

9   the secondary server and to deploy the copied user-defined routines on the secondary

10   server.

1   **10.**   The database backup system as set forth in claim **9**, wherein the

2   user-defined routines define an R-tree index and the user-defined routines replicator

3   includes:

4   a lock mechanism for locking the R-tree index;

5   a capsule extractor that retrieves stored encapsulated information about the

6   user-defined routines defining the R-tree index and copies the retrieved encapsulated

7   information over to the secondary server;

8   an R-tree data extractor that retrieves R-tree index data and copies the retrieved

9   R-tree data over to the secondary server; and

10   an unlocking mechanism for unlocking the R-tree index.

1   **11.**   The database backup system as set forth in claim **10**, further including:

2   a log replay module that replays the copied database log entries on the secondary

3   server to effect update of the secondary server, the log replay module accessing the

4   copied encapsulated information and the copied R-tree data responsive to replaying

5   database log entries that call for accessing the R-tree index.

1   **12.**   The database backup system as set forth in claim **9**, wherein the

2   user-defined routines define an R-tree index and the user-defined routines replicator

3   includes:

4   a first thread executing on the primary server that transmits the user-defined

5   routines deployed on the primary server to the secondary server; and

6   a second thread executing on the secondary server that receives and deploys the

7   copied user-defined routines on the secondary server to create a copy of the R-tree index

8   on the secondary server.

1   **13.**   The database backup system as set forth in claim **12**, wherein:

2   the first thread locks the R-tree index on the primary server during the

3   transmitting; and

4   the second thread sends an acknowledgment to the first thread indicating that

5   second thread received the user-defined routines, the first thread unlocking the R-tree

6   index responsive to receipt of the acknowledgment.

1   **14.**   The database backup system as set forth in claim **9**, wherein the

2   user-defined routines replicator is integrated into the data replicator to define a unitary

3   database backup system.

1   **15.**   An article of manufacture comprising one or more program storage media

2   readable by a computer and embodying one or more instructions executable by the

3   computer to perform a method for maintaining a multi-dimensional index of contents of a

4   database system that includes a primary database deployed on a primary side, a secondary

5   database deployed on a secondary side, and a data replication module replicating contents

6   of the primary database to the secondary database by replaying database log entries of the

7   primary database on the secondary side, the method including:

8   after creation of the multi-dimensional index of contents and prior to executing

9   database operations that access the multi-dimensional index of contents, performing an

10   index replication process including:

11   locking the multi-dimensional index on the primary side,

12   copying the multi-dimensional index to the secondary side, and

13   unlocking the multi-dimensional index on the primary side;

14   wherein after the performing of the index replication process, database operations that

15   access the multi-dimensional index of contents are performed on the primary side and

16   database log entries corresponding thereto are replayed on the secondary side, the

17   replaying accessing the copy of the multi-dimensional index on the secondary side.

1   **16.**   The article of manufacture as set forth in claim **15**, wherein the

2   multi-dimensional index is a range tree index.

1   **17.**   The article of manufacture as set forth in claim **16**, wherein the copying of

2   the range tree index to the secondary side includes:

3   copying a capsule containing user-defined routines defining the range tree index

4   to the secondary side.

1   **18.**   The article of manufacture as set forth in claim **17**, wherein the copying of

2   the range tree index to the secondary side further includes:

3   copying entries of the range tree index to the secondary side.

1   **19.**   The article of manufacture as set forth in claim **15**, wherein the performing

2   of an index replication process further includes:

3   registering the copy of the range tree index on the secondary side with the

4   secondary database.

1   **20.**   The article of manufacture as set forth in claim **19**, wherein the secondary

2   database system is selected from a group consisting of an Informix Dynamic Server and

3   DB2 database.